

for a period of 11 weeks. The *Ohio*, *Cumberland* and *Tennessee* fell generally throughout the month at all stations.

Ice in Rivers and Harbors.—During the present month Duluth is the only station, within the limits of the Signal Service, reporting interruption of navigation by ice, and the following notes from this station are interesting: On the 1st, steamer *Quebec* made her way through eight miles of ice, which blocked the harbor, and was the first arrival of the season; on the 3rd, steamer *J. L. Hurd* started out, but became blocked in the ice about two miles from shore, and was unable to proceed until the 4th; on the 6th, several vessels were blocked in the ice while coming into port; on the 13th, vessels were still blocked, and the ice in some places was estimated to be forty feet deep, being backed up by strong NE. winds; on the 15th, some vessels succeeded in passing out, and on the 19th, the ice was driven out by strong westerly winds and the lake reported clear.

High Tides.—At Indianola on the 1st, 15th and 16th; on the latter date the water covered the streets, in some places to a depth of 18 inches. At Galveston, 15th, 16th, and 17th; on the 16th many streets were partly under water. At Pensacola, 24th, very high tide.

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors, with average depth at which observations were taken, is given in the table on the left-hand side of chart No. II. At the following stations observations were not made on the dates indicated: Duluth, 1st to 9th, hindered by ice; San Francisco, 1st to 17th, instrument broken.

ATMOSPHERIC ELECTRICITY.

Thunder-storms—were reported from the various districts on the following dates: New England, 3rd to 7th, 9th, 10th, 19th to 21st, 26th to 28th; Middle Atlantic States, 5th, 9th, 10th, 11th, 14th, 20th to 23rd, 26th, 27th, 28th; South Atlantic States, 4th, 11th, 12th, 22d, 23rd, 24th, 28th and 30th; Eastern Gulf States, 2d, 4th, 10th, 11th, 12th, 13th, 20th, 23rd, 24th to 27th, 29th, 30th, 31st; Western Gulf States, 1st, 2d, 4th, 5th, 12th to 16th, 18th, 19th, 20th, 23rd to 31st; Lower Lake region, 8th, 9th, 10th, 19th to 22d, 26th, 27th, 29th to 31st; Upper Lake region, 5th, 7th, 9th, 10th, 18th, 19th, 23rd, 24th, 31st; Ohio valley and Tennessee, 5th, 9th, 10th, 11th, 12th, 20th, 23rd, 24th, 27th, 29th, 31st; Upper Mississippi valley from 3rd to 31st; Lower Missouri valley, 3rd, 6th, 8th to 19th, 21st, 23rd to 31st; Eastern Rocky Mountain slope, 8th, 9th, 14th, 18th, 19th, 20th, 26th, 28th, 31st; Colorado, 19th and 28th; New Mexico, 28th; Utah, 26th; Wyoming, 3rd; Idaho, 15th; California, 12th at Princeton and Red Bluff; Washington Ter., 7th and 27th.

Auroras.—During May, 1880, three general auroral displays were observed over the United States, namely: on the 1st and 2nd, extending from Eastport, Me. to Montana; on the 14th, extending from New Hampshire and Massachusetts to Lake Superior, and from the 26th to the 28th, from New Hampshire to Montana. The most southerly stations reporting auroras were: Girard, Kans., New Corydon, Ind., and New London on the 1st; Woodstock, Md., on the 4th (very faint) and Cedar Vale, Kans., on the 7th. La Crosse, Wis., 1st, from 8:45 p. m. to midnight; color nearly white; in form of an arch, with lower edge well defined, with centre 10° above horizon. Below arch a dense haze, very dark in color and in striking contrast with the rest of the sky, which was very bright and clear. No beams or columns, merely a diffuse light, quite brilliant at times, nearly disappearing for a few seconds, and reappearing again. Arch extended from about 40° east to 30° west of magnetic meridian. Bismarck, 1st, 9:00 p. m., observed in northwest, extending upward about 30° . Duluth, 1st, 9 p. m., light grayish color, two arches, breaking up about 10 p. m. into beams of light, shooting upward to a great height, some of larger beams reaching to several degrees beyond the zenith. Aurora also observed at 10 p. m. of 2nd. Toledo, 1st, 10:50 p. m., shifting from E. to W. along the north horizon, many streamers reaching to zenith, disappeared at 11:30 p. m. Eastport, 1st, 8:20 p. m. to 2:45 a. m. of 2nd. Burlington, Vt., 2nd, 11:15 p. m. to 12:30 a. m., 3rd, green, dark segment, no arch of light or streamers. New London, 1st, 9 to 11 p. m. Bangor, Me., 2nd, 11:35 p. m. to midnight, very brilliant beams and dancers; altitude 45° ; azimuth 75° to 290° . Clear Creek, Neb., 1st, 8 p. m. to 11 p. m., from W. to NE. brightest in NW. Cresco, Ia., 1st, 9:15 p. m., bright low arch in NE. 10 p. m., a few straggling streamers; 10:30 p. m., disappeared; 2nd, 10:30 p. m., a few faint streamers starting from northern horizon. Gardiner, Me., 1st, 9 p. m. to midnight, very bright. 2nd, not very bright; obscured by clouds before midnight. Newburyport, Mass., 2nd, diffuse light above dark segment; a few streamers, no motion, disappeared at 10:20 p. m. Lima, N. Y., 1st, 9:50 to 10:50 p. m., faint, E. three to five streamers. St. Paul, 1st, 10 p. m., dark segment, with luminous arc; continuous motion from to W.; color, pale yellow and orange; remained visible about 40 minutes; telegraph wires perceptibly affected. Pembina, 1st, appeared at 8:30 p. m., and continued throughout night; no continuous arch except for a minute or two, and dark segment scarcely visible. The aurora extended from about 160° to 280° azimuth, with an altitude at various times reaching to the zenith; colors, crimson, yellow and green, very transparent. Breckenridge, 1st, 8 to 10:40 p. m., light green color tinged with red. Burlington, Vt., 14th, from 9 p. m. to 12:30 a. m. of the 15th, light arch of light, pale green. Auburn, N. H., from 9:20 p. m., of 14th, to early morn of 15th. Toledo, 26th, 8:50 p. m., altitude of streamers, 30° to 90° ; no lateral motion; disappeared at 11 p. m. Oswego, 26th, 9:15 to 9:50 p. m., NE. to NW.; altitude to zenith; dark segment sur-

mounted by diffuse light from which shot innumerable bright beams. Buffalo, 26th, 9:15 to 9:30 p. m., extending from NE. to NW.; beams having an apparent rapid upward movement to an elevation of about 60°, with a slow lateral movement to the west; color, reddish tinge. Lima, N. Y., 26th, 9:15 p. m., to 10:15 p. m.; streamers 9:37 p. m.; altitude 35°. Bismarck, 27th, from 9 to 10 p. m., altitude about 5°. Trenton, N. J., 8:30 to 8:45 p. m. Burlington, Vt., 28th, from 11:15 to 11:25 p. m., pale green.

Telegraphic Communication Interfered with by Atmospheric Electricity.—Pike's Peak, 19th, 21st; Fort Sill, 26th; Mason, Tex., 1st, 4th, 27th; Boerne, Tex., 28th; Castroville, Tex., 1st, 19th, 20th, 23rd, 24th, 27th, 28th, 29th; Fredericksburg, Tex., 1st, 27th, 29th; Uvalde, Tex., 1st, 19th, 23th, 24th; Laredo, Tex., 23rd, 24th; Stockton, Tex., 4th, 6th, 12th, 13th, 17th, 18th, 19th, 23rd, 24th, 28th, 31st; Davis, Tex., 11th, 14th, 17th; Brackettsville, Tex., 2nd, 23rd, 24th, 28th; Pilot Point, Tex., 28th, 29th. McKavett, Tex., 27th, 28th; Ft. Elliott, Tex., 29th, 31st. On the summit of Mt. Washington, 12th and 26th, St. Elmo's fire appeared on tops of anemometer and anemoscope.

OPTICAL PHENOMENA.

Solar Halos were reported from the various districts on the following dates: New England, 3rd, 4th, 5th, 7th, 8th, 11th, 15th, 18th, 25th, 26th, 28th, 29th; Middle Atlantic States, 1st to 11th, 15th, 19th, 29th; South Atlantic States, 2nd, 5th, 11th, 12th, 22nd, 29th; Eastern Gulf States, 4th, 5th, 6th, 12th, 14th, 16th; Western Gulf States, 1st, 14th, 15th, 17th; Lower Lake region, 2nd to 6th, 9th to 12th, 16th to 20th, 24th, 29th, 31st; Upper Lakes, 1st, 2nd, 6th, 8th, 9th, 20th, 21st, 23rd, 25th, 29th; Ohio valley and Tennessee, 2nd, 4th, 9th, 10th, 11th, 23rd, 26th, 28th, 29th, 31st; Upper Mississippi valley, 1st, 2nd, 8th, 9th to 13th, 18th to 22nd, 25th, 29th; Missouri valley, 1st, 2nd, 5th, 7th to 10th, 15th, 17th to 22nd, 24th, 25th; Middle Plateau, 4th, 7th, 16th, 18th to 21st, 29th; California, 1st, 7th, 13th, 15th, 16th, 23rd, 24th, 29th; Oregon, 1st, 5th, 6th, 10th, 14th, 18th, 21st; Washington Territory, 15th, 18th, 19th, 21st.

Lunar Halos were reported from various districts on the following dates: New England, 2nd, 15th, 20th. Middle Atlantic States, 11th, 15th, 17th, 19th to 23rd, 29th. South Atlantic States, 21st to 26th. Eastern Gulf States, 13th to 20th, 23rd, 26th. Western Gulf States, 14th to 23rd. Lower Lake region, 17th, 19th, 23rd, 28th, 29th. Upper Lake region, 13th, 14th, 16th, 19th, 22nd. Ohio valley and Tennessee, 17th, 18th, 28th, 29th. Upper Mississippi valley, 13th, 16th to 20th; Missouri valley, 3rd, 16th to 22nd, 24th. Rocky Mountains, 16th to 21st. Middle Plateau, 17th, 19th, 24th. Pacific coast, 14th, 15th, 17th, 18th.

Mirage.—North Platte, 3rd; Ft. Niagara, N. Y., 4th, 2 p. m.

MISCELLANEOUS PHENOMENA.

Sunsets.—The characteristics of the sky at sunset as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service Stations. Reports from 124 stations show 3,829 observations to have been made, of which 22 were reported doubtful; of the remainder, 3,142 or 82.5 per cent. were followed by the expected weather.

Zodiacal Light.—Wabash, Ind., 1st to 7th, 12th. Yate's Centre, Kan., 2nd, 3rd, 5th, 6th, 7th, 29th. Harvard College, Cambridge, Mass., looked for every clear evening but none seen; evenings of the 2nd, 6th, 8th and 10th were the only ones when the presence of the light could have been seen. Somerset and Fall River, Mass., 2nd. Oregon, Mo., 1st, 2nd, 3rd, 6th, 7th, 8th. Clear Creek, Neb., 2nd. Atco, N. J., 2nd, 3rd, 4th, 5th, 9th, 10th, 25th. Bellefontaine, Ohio, 1st, 3rd to 8th, 11th. Walnut Grove, Va., 3rd, 4th, 7th, 25th. Mr. Chas. Hasselbrink, at Havana, reports "cloudiness and moonshine have been a great hindrance to observations on the zodiacal light during the whole month of May, 1880." The zodiacal light was visible on the following dates: 1st and 2nd, of great extension, intermittent. 25th, 8 to 9 p. m., of great lateral extension and exceedingly bright; relative humidity, 78 per cent. 28th, 8:30 to 9:45 p. m., exceedingly bright and of great azimuthal extension, with the line of axis strongly inclined to the left (south); relative humidity, 82 per cent. Mr. Hasselbrink, in forwarding the above, observes "this concurrence of facts, namely, brightness, extension and humidity, strengthens my belief that the light is more visible in damp than in dry weather."

Meteors.—San Francisco, 6th, 9:30 p. m., very brilliant, course SE. to NE., burst with a loud report and with a gorgeous display of colors. North Platte, 8th. Pensacola, Fla., 6th, 7th, 9th, 24th, 28th, 31st. Little Rock, Ark., 5th, 11th, 25th, 30th. Cedar Keys, Fla., 30th. Boise City, 19th. Knoxville, 12th. Ft. Dodge, Ia., 13th, 9 p. m. Yates Center, Kan., 20th. Point Pleasant, La., 9th. Woodstock, Md., 9th, 25th, 26th, 27th. Fall River, Mass., 26th. Fayette, Miss., 5th. Corning, Mo., 27th, 31st. Clear Creek, Neb., 28th.

Prarie and Forest Fires.—Milford, Pa., 12th to 14th, "terrible forest fires," over 3 million feet of lumber, a vast amount of valuable timber and several houses and barns destroyed. Atlantic Co., N. J., 14th, the loss by fires in this county on live stock, buildings, timber, &c., is estimated at \$200,000 not including the loss of \$20,000 on the vineyard around Egg Harbor City. In Galloway township 30 buildings were burned. Gibson's Mills, N. J., 14th, scarcely an acre of timber land for miles around which has not been swept by fire, many dwellings and outbuildings burned. Alison, N. J., 14th, over 100 square miles of valuable berry-bogs, timberland and vineyards, have been destroyed. At the village of Great Republic, 22 buildings